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ABSTRACT

The study examined the effectiveness of three two-way interactive television courses offered by the University of Utah in providing special education teacher instruction. The courses utilized technology which allowed course instructors as well as distance learners to hear and see each other during instruction. The three courses were offered sequentially and each previously offered course served as a control for the course that followed. Evaluation by students indicated that "provision of feedback relating to student progress" improved from the first to second and third courses. Only the third course, which included trained site facilitators/instructors and a well designed student manual, was rated as significantly better than a conventional course. Gains were also made over time in student perceptions of "organization of the course" and "helpfulness" of the visual material. (DB)

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**Two-way Interactive Television Instruction:
Comparative Studies of Instructional Effectiveness in Three
Rural/Remote Special Education Courses**

by

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The transmission of university courses to rural/remote university students via two-way interactive television is relatively new. Very few interactive television courses allow the instructor as well as distance learners to see and hear each other during class sessions. Generally distance learners initiate interactions through dedicated phone lines. Incoming questions and comments from off-campus learners are transmitted from a microphone through a phone line to the on-campus studio classroom. The questions or comments are heard by the instructor through a speaker system in the studio classroom. Instructor responses are then transmitted through the television medium. Rarely would an instructor actually see the distance learners unless he or she were actually able to visit the remote learning sites or have the off-campus learners come to the on-campus class.

For the past four years the Department of Special Education at the University of Utah has transmitted a variety of teacher certification courses through a sophisticated two-way interactive television system. This system is totally interactive in that course instructors as well as distance learners may hear as well as see each other while the instruction is taking place. The on-campus instructor may see only one remote classroom site at time, but the switching from one site to another occurs very rapidly usually within a few seconds. Thus any off-campus student who desires to engage in a discussion or ask a questions is quickly seen not only by the course instructor but also by all of the participants in each of the various sites.

The research dealing with the effectiveness of two-way interactive television is limited (Whittington, 1987). Ellis & Mathis (1985) examined the learning outcomes associated with interactive television instruction. They found that students who had received their instruction

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through interactive television demonstrated learning outcomes that were equal to those obtained through face to face instruction in traditional learning settings. Additionally student perceptions regarding various aspects of the televised instruction via Instructional Television Fixed Service (ITFS) seem to be relatively positive (Roth, 1980). Participants in the Roth study indicated that they liked the ITFS delivery approach and maintained that they had grown significantly in knowledge.

The potential utility of interactive television for delivering courses to distant learners and teachers in rural/remote areas appears to be very promising (Egan & Sebastian, 1987; Egan & McDonnell, 1987). However, evaluations of interactive television courses have been limited in scope (Dirr, 1985; Rollyson, 1984; Whittington, 1987). The primary focus of past studies dealing with interactive televisions has been the evaluation of learning outcomes related to grades earned in the telecourses and pre and post-test comparisons. The variables that may contribute to effective, two-way interactive, television instruction have not been carefully delineated or analyzed.

The present studies were designed to examine variables that may be influential in not only shaping student outcomes, but also student perceptions about the value of the television instruction. Three different two-way interactive television courses were intensively evaluated. Students in each of the three courses were given the opportunity to evaluate various aspects of the television instruction. The first course was compared to the second and third courses offered. Similarly, the second course was compared to the third. Each previously offered course served as a control for the course that followed. The specific hypotheses for each study were that there would be no significant differences between the control courses and experimental courses on each of the various instructional effectiveness variables that had been selected for investigation.

METHODS

Subjects

Subjects for all of the studies were bachelor's or post-bachelor's certification students enrolled in a teacher certification program in special education. Data regarding a variety of demographic measures were collected on each subject. Table 1 provides a summary of the responses to the demographic survey for each course.

(Please insert Table 1 about here.)

Course Descriptions

The first interactive television course focused on the skills that are needed to develop programs and classroom environments for elementary students with behavior disorders. Student learning outcomes included skills related to identifying, placing, educating and evaluating students with behavior disorders. The second course was basically the same as the first course except that it emphasized strategies and interventions that are primarily used with secondary students with behavior disorders. The last course, Applied Behavior Analysis, focused on the principles and procedures of identifying behaviors for change, collecting and graphing data, arranging consequences for increasing and/or decreasing behaviors, maintaining behavior change and ethically using behavior modification.

Measures and Data Analysis

Several variables were selected for analysis in making comparisons between the courses. These variables included Likert ratings of the following: (1) the instructor's overall teaching effectiveness, (2) the provision of feedback related to student progress, (3) the amount of material covered in each of the courses, (4) the level of difficulty in each course, (5) the organization of the course, (6) the helpfulness of slides, films, and other visual media used during the course. These variables were drawn from two data collection instruments, the Course Evaluation utilized by the Department of Special Education and the Media Services

Evaluation developed by Instructional Media Services at the University of Utah. Data generated from the student and media evaluations were analyzed using a series of two tailed t tests. A significance level of .01 was established as a basis for rejecting each hypothesis related to each factor.

PROCEDURES

Distinctive experimental conditions were present in each of the three courses investigated in the studies. The experimental conditions were introduced sequentially and systematically as a function of instructor experience and data generated from previous course and media evaluations. The distinctive properties of the first course were (1) weekly quizzes that were given and immediately scored during the first 30 minutes of each class session; (2) course handouts and support materials that were delivered the day before the class, on the day of the class or late via common carrier; (3) the presence of an on-site facilitator who was primarily responsible for distributing course materials and handouts for the off-campus students, (4) feedback regarding course assignments that was generally delivered several weeks after the assignments had been submitted, and (5) course projects and assignments that were developed without input from the participating distance learners.

The distinguishing features of the second course were: (1) the presence of on-site facilitators whose roles has been expanded beyond that of distributing handouts and quizzes; (2) student participation in selecting course assignments and methods for student evaluation; (3) typical midterms and final examinations rather than weekly quizzes; (4) provision of feedback that was promptly delivered, and (4) the continuation of course support materials that were delivered weekly. The third course was characterized by the following features: (1) intensive involvement of site instructors/facilitators in providing feedback, responding to questions and providing assistance in completing class projects and assignments; (2) weekly quizzes corrected by the site instructors/facilitators accompanied by a midterm and final examination, (3)

provision of all student materials at the first class session and (4) instruction that was delivered "face to face" at least once to two of the three off-campus classroom sites during the duration of the course.

RESULTS

The results of each of the three studies will be presented sequentially, that is, the first course will be compared to the second course offered then the first course will be compared to the third course. Lastly, the second course will be compared to the third course. Analysis outcomes will be reported for two variables on the course evaluation and five variables on the instructional media evaluation.

COMPARISONS: COURSES 1 & 2

Course Evaluations. The mean scores for the student evaluation factor, "Overall rating of the instructor's teaching effectiveness," for the first and the second distance learning courses were respectively 5.16 and 5.33. The t value for these scores was -0.45 . There was no significant difference between these ratings as given by the distance learners enrolled in each of these classes ($p = .655$). The mean scores for the second factor, "Provision of feedback relating to student progress," was 3.22 for the first course and 5.19 for the second course. The t value was -4.64 . A significant difference was established between these two means ($p = .001$).

Instructional Media Evaluations. Two-tailed t tests of significance were employed to examine the differences between means on five variables on the instructional media evaluation. The mean ratings for the first variable on the media evaluation, comparison of the interactive television course to a conventional course, were 2.44 for the first course and 2.95 for the second course. No significant difference was established between the two courses on this variable (t value of -1.93 , $p = .06$).

The means for the second variable, adequacy of the amount of material covered, for the first course and the second course were respectively 3.64 and 3.35. There was no significant difference between the two courses on this variable.

The means generated for the third variable, "level of difficulty of the course" were 3.88 for the first course and 3.85 for the second course. No significant difference was established between the means on this variable.

The means for the fourth variable, "How well organized was the content of the course?" were 3.05 for the first course and 4.31 for the second course. A significant difference was found in comparing the two courses on this variable ($t = -4.37$, $p = .0001$).

Means for the fifth variable, helpfulness of the visual media (slides, films, video tapes, etc.) in supporting the presenter's delivery, were 3.35 for first course and 3.60 for the second course. The two-tailed t test of significance revealed no significant difference between these means ($t = -0.69$, $p = .49$).

COMPARISONS: COURSES 1 & 3

Course Evaluations. The mean scores for course evaluation factor one, rating of the instructor's overall teaching effectiveness, for the first and third courses were 5.16 and 5.63. The t value for these scores was -1.54. There was no significant difference ($p = .1302$) between the ratings given by the first class and the third class. With regard to the second course evaluation variable, "Provision of feedback relating to student progress," the mean score for the first class was 3.22. The mean scores for the third class was 5.46. There was a significant difference between these two means ($t = -5.04$, $p = .0001$).

Instructional Media Evaluation. The mean ratings for the first variable on the media instructional evaluation, comparison of the interactive television course to a conventional course, were 2.44 for the first class and 3.41 for the third class. A significant difference was established between the two classes on this variable (t value of -3.86, $p = .0004$).

The means for the second variable, adequacy of the amount of material covered, for the first and third classes were respectively 3.64 and 3.41. There was no significant difference between the two classes on this variable.

Means for the third variable, level of difficulty of course content, were 3.88 for the first class and 4.17 for the third class. No significant difference was established between these two means ($t = -1.08$, $p = .2852$)

The means for the fourth variable, course content organization, were 3.05 for the on-campus group and 3.65 for the rural/remote group. No significant difference was found in comparing the two groups on this variable ($t = -1.84$, $p = .0736$).

Means for the fifth variable, beneficialness of the text screens in supporting the instructor's delivery, were 3.35 for the first class and 4.24 for the third class. The two-tailed t test of significance revealed a significant difference between the means ($t = -3.16$, $p = .0028$).

COMPARISONS: COURSES 2 & 3

Course Evaluations. The mean score for the first course evaluation factor, overall teaching effectiveness, was 5.33 for the second class and 5.63 for the third class. The t value for these scores was -1.23. There was no significant difference ($p = .222$) between the ratings given by the second class in comparison to the third class. Means scores for the second variable, provision of feedback, was 5.19 for the second class and 5.46 for the third class. The p value for these means was nonsignificant.

Instructional Media Evaluation. The mean ratings for the first variable on the media evaluation were 2.95 for the second class and 3.41 for the third class. A significant difference was not established between the two groups this variable (t value of -2.14, $p = .0371$).

The means for the second variable for the first class and the third class were respectively 3.35 and 3.41. There was no significant difference between the two groups on this variable.

Means for the third variable, level of difficulty of course content, were 3.85 for the

second class and 4.17 for the third class. No significant difference was established between these two means.

The means for the fourth variable, course content organization, were 3.65 for the second class and 4.31 for the third class. A significant difference was established on this variable ($t = -2.80$, $p = .0072$).

Means for the fifth variable, beneficialness of the text screens in supporting the instructor's delivery, were 3.60 for the second class and 4.24 for the third class. The two-tailed t test of significance revealed no significant difference between the means ($t = -2.33$, $p = .0241$).

DISCUSSION

The studies were designed to carefully compare the changes and differences that occurred over time in the ratings given by distance learners in three separate, two-way interactive television courses. Specifically the investigators were interested in determining the effects of various experimental conditions on these ratings. Each of the previously offered course served as a control for the experimental course, that is, course one was the control for courses two and three. Likewise course two was a control for course three.

Course Evaluation Ratings

The mean ratings (see Figure 1) of the "instructor's overall teaching effectiveness" across the three courses were not significantly influenced by the changes in experimental variables. Improved feedback, increased student input, changes in exam and quiz procedures did not profoundly influence the distance learner's perception of the instructor's teaching effectiveness. The Likert ratings for three courses remained about the same with a slight elevation in the mean rating of the last course. Moreover, the mean ratings for each course were relatively high given the 1-7 range of the Likert scale.

(Please insert Figure 1 about here.)

The "provision of feedback relating to student progress" in the first course was rated as being below average (see Figure 2). However, over time the ratings regarding the provision of feedback improved significantly from course one to course two and from course one to course three. It is difficult to determine which of the experimental conditions in combination or in isolation may account for the changes in learners' perceptions of the feedback that they received. The instructor did attempt to reduce the overall "turn around" time in processing assignments from several weeks to less than seven days. Also, the number and scope of weekly assignments required in the second course was less in comparison to the number required in the first course. Distance learners in the first course completed weekly simulations, and quizzes. The second course was devoid of these particular instructional activities. Weekly quizzes were replaced with a midterm and final examination. Again, great effort was exerted to promptly correct and return midterm exams as well as other course assignments.

(Insert Figure 2 about here please)

The delivery of feedback in the third course was decidedly strengthened through local facilitators/instructors. These were individuals who had completed the course earlier and were certified in special education. Additionally, they were practiced in using the skills and concepts taught in the course. These clinically skilled teachers attended each class session and responded to questions both before and after each televised instructional session. They provided feedback regarding weekly quizzes and other assignments as would be provided in the typical on-campus course. Moreover, distance learners could consult with their local facilitator/instructor during the week in their own community.

Instructional Media Evaluations

Five variables were examined through the instructional media evaluation. However, the analysis revealed only three variables in which the ratings over time improved significantly. The ratings were derived from the following questions: (1) "How would you rate this telecourse

compared to a conventional course?" (2) "How well organized was the content of the course?" and (3) "How helpful was it to have slides, films, and other visual media used in the course?"

In courses one and two, the mean ratings for the question, "How would you rate this telecourse to a conventional course?" were below average, the first course more so than the second course offered (see Figure 3). Course three was the only course in which the mean Likert rating exceeded 3.00. In fact, the distance learners rated this course as being significantly better than a conventional course. Again, it is difficult to determine to what extent the various experimental conditions contributed to the significant improvement in the ratings on this variable. However, this course in contrast to courses one and two was accompanied by several distinctive experimental features. The first of these was the experience of the instructor and the previous data that had been collected. Using the data gathered and his experience in teaching two other two-way interactive courses, he was able to make some of adjustments, not only in his teaching behavior but in other instructionally relevant areas. Some of these adjustments included the training and utilization of site facilitators/instructors whose roles were described earlier. Courses one and two did not have these support personnel. Also, the distance learners in the third course had a well designed student manual from the very beginning of the course. It contained lecture outlines, handouts, and quiz preparation materials that were carefully correlated with the television instruction. Session materials did not arrive late as was often the case in course one and sometimes in course two. In general the experimental conditions present in the third course were outgrowths of the formative evaluations that were conducted in courses one and two, that is, problems were identified and steps were taken to resolve the problems.

(Insert Figure 3 about here please.)

Significant gains were made over time in the perceptions of distance learners regarding the organization of the instructional content of particularly course three (see Figure 4). It was viewed as being "very well organized." Again these perceptions may have been a function

of several interacting experimental conditions. One such condition was the provision of a well designed student manual that was carefully conceived and closely correlated with the content conveyed in each course session. As a rule, the learners in the third course had a clear view as to where the instructor was going in a presentation or lecture and what he intended to have them learn. This was accomplished through the student manual. Each class session was precisely laid out with a lecture outline, study questions, and exam preparation questions. Another related factor that was the experience of the instructor. By the third course, he had taught 120 hours using two-way interactive television. Again it is difficult to accurately identify which of the experimental conditions contributed significantly to changes in ratings regarding course organization.

(Insert Figure 4 about here please.)

Only one significant difference was established on the variable dealing with the "helpfulness" of the visual materials in conveying course information and concepts (see Figure 5). This difference was established between course one and course three. Course three received the highest overall mean rating on this variable. Again it is difficult to determine exactly why the perceptions of the two groups are so vastly different on this variable. The number and kinds of media presented in courses one and two were about the same. It may well be that the media in course three corresponded more closely with the content presented through class lectures and other learning activities than did that presented in course one. Further evaluation of this variable is needed before any firm conclusions can be reached.

(Insert Figure 5 about here please.)

Summary

Significant gains were made over time on a variety of variables in the teaching of three two-way interactive television courses. Formative evaluations were successfully utilized to identify areas of concern in the teaching of interactive television courses. Steps were then taken to address these concerns by altering various instructor behaviors, instructional

procedures and service delivery systems. Significant changes did occur over time in distance learners' perceptions of the provision of feedback, the value of each course compared to a conventional course, the organization of each course, and the helpfulness of the visual materials that were shown in each course. It is clear that corrective actions can be taken to improve the instruction that is delivered to distance learners through two-way interactive television. Additionally, further research is needed to identify the variables that contribute to successful learning and learner satisfaction through two-way interactive television instruction.

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Two-way Interactive Television

Table 1

14

Summary of Professional Experience and Training for each Course

Courses		
1st Course	Regular Educators:	62%
	Years of Teaching in Regular Education	4-5 years
	Years Teaching Special Education	5 years
2nd Course	Regular Educators:	62%
	Years of Teaching in Regular Education	4-5 years
	Years Teaching Special Education	5 years
3rd Course	Regular Educators:	12%
	Years of Teaching in Regular Education	1-2 years
	Years Teaching Special Education	1-2 years

Figure 1. Course Evaluation Ratings of Overall Instructional Effectiveness Across the Three Courses

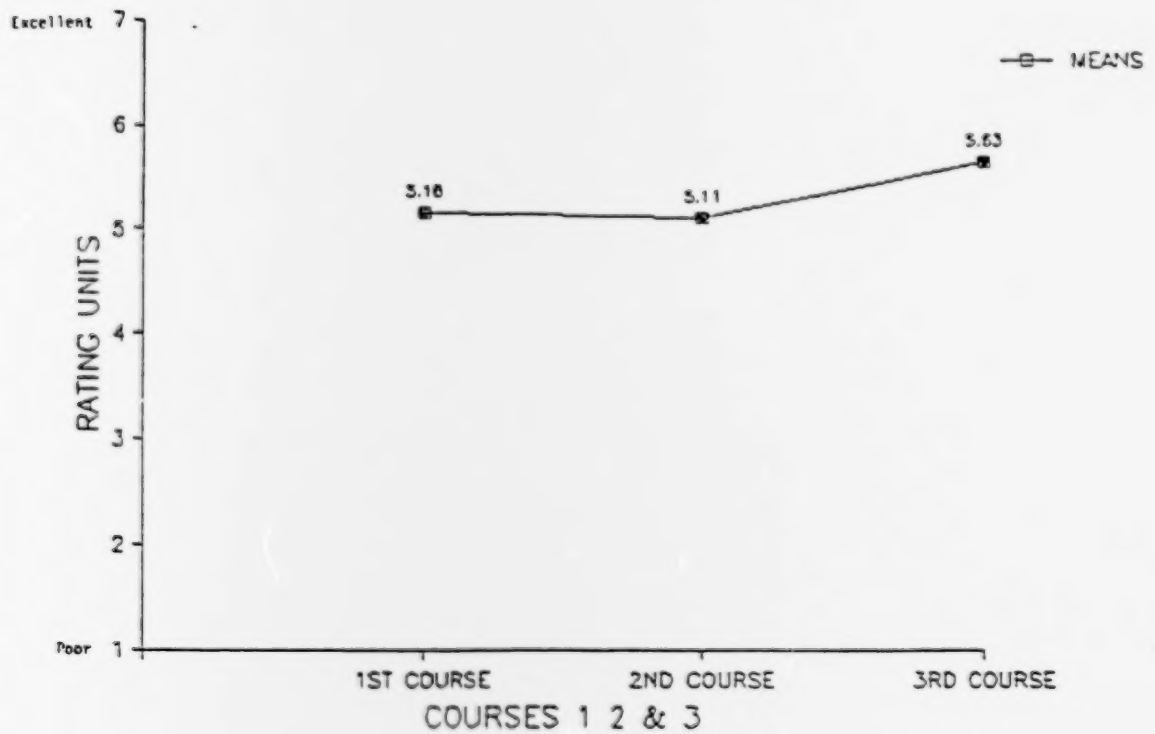


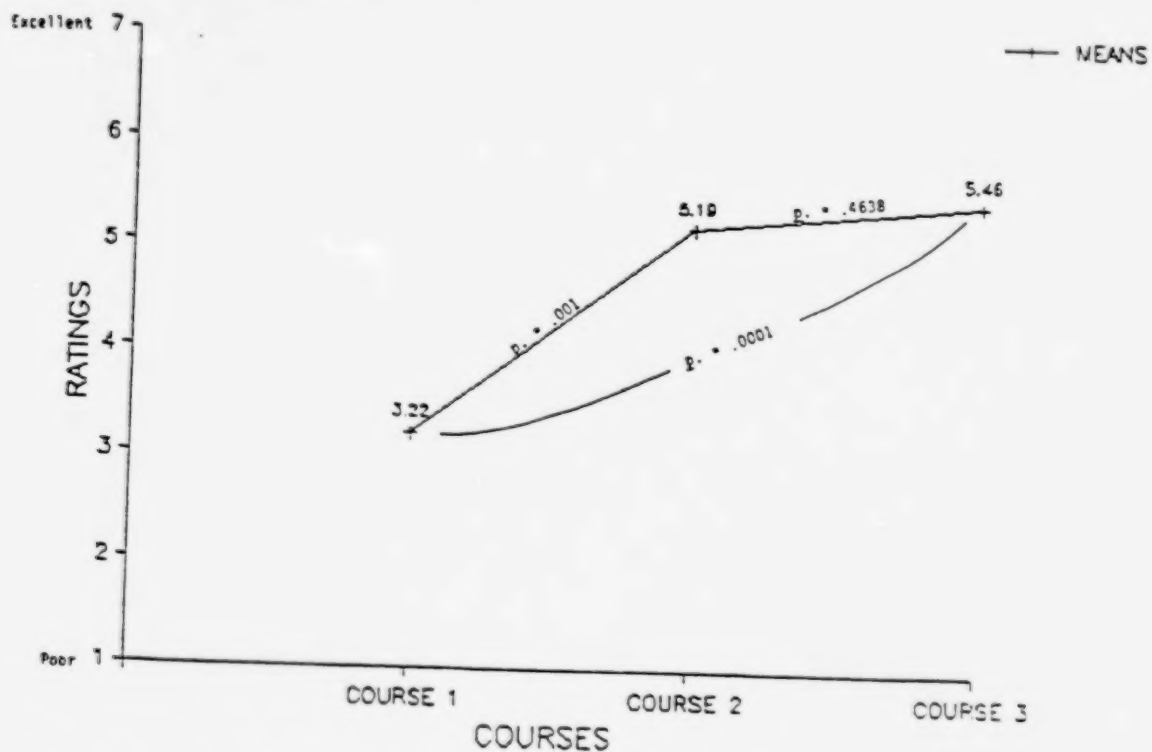
Figure 2. Course Evaluation Ratings of "Provision of Feedback" Across the Three Courses

Figure 3. Instructional Media Ratings of "Comparison to a Conventional Course" Across the Three Courses

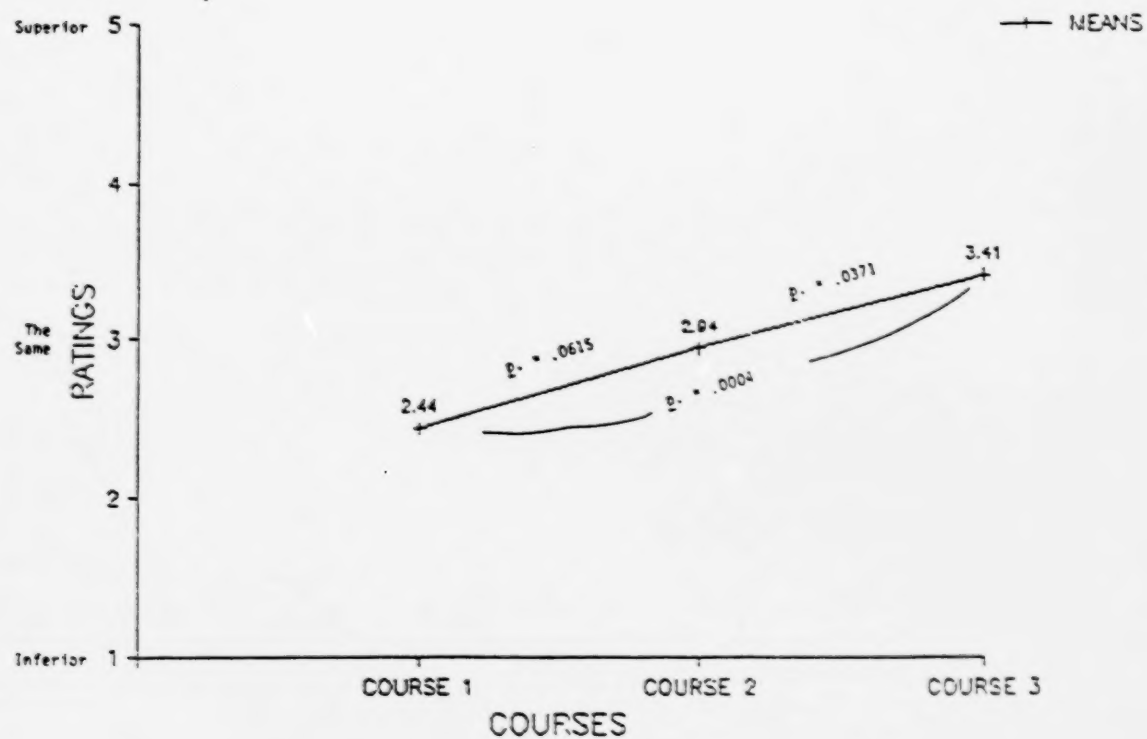


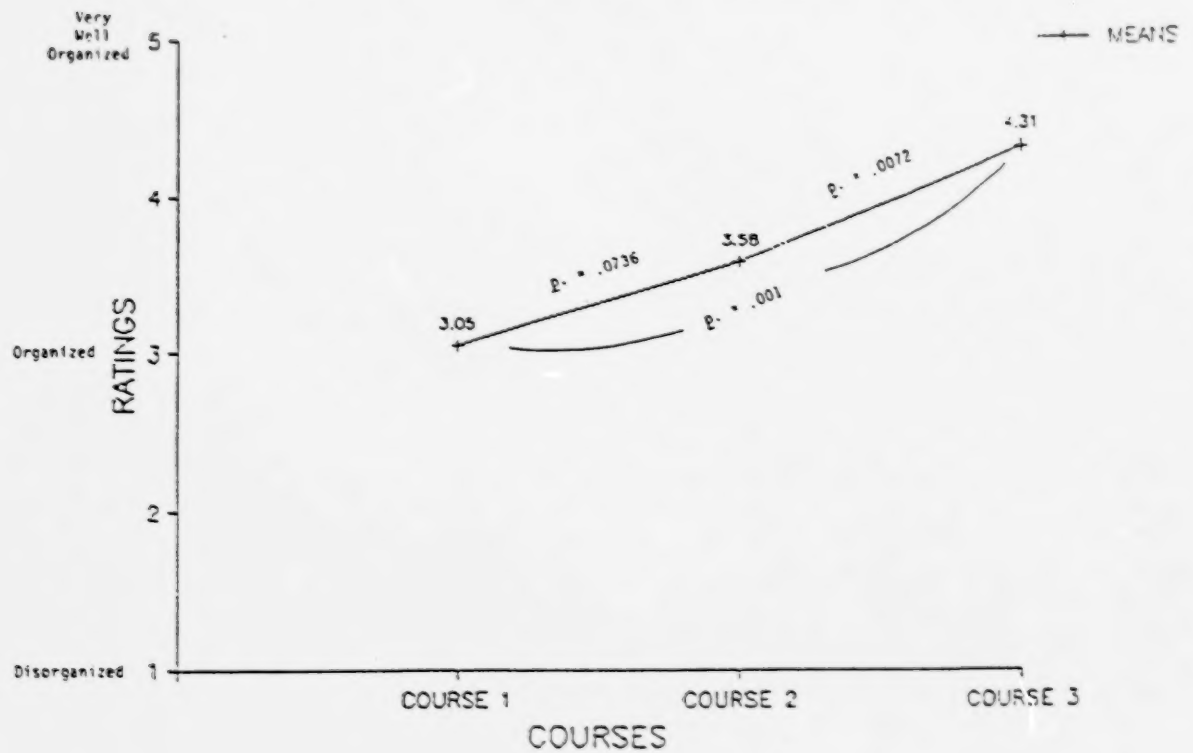
Figure 4. Instructional Media Ratings of "Course Organization" Across the Three Courses

Figure 5. Instructional Media Ratings of "Helpfulness of Visual Materials" Across the Three Courses

